

Packaging machine, especially vertical-type packaging machine, and method

The invention relates to improvements of a packaging machine, especially vertical-type packaging machine, for producing tubular bags from a foil web, wherein the machine comprises a shaping shoulder, an edge forming means and a special sealing means, wherein the special sealing means is provided to apply to the foil a longitudinal seal and an edge seal in a direction parallel to the direction of flow of the foil.

A common method of making bags out of a foil web is the use of a vertical forming, filling and sealing machine. Such a packaging machine receives a continuous flat sheet (or foil) of plastic material (e.g. a thermoplastic material), which is fed forwardly and passed downwardly over a shaping shoulder and then shaped into a tubular form, i.e. into a foil tube, by being wrapped around a vertical forming axis of the packaging machine. After wrapping around the vertical forming axis, the foil web is longitudinally closed by means of a longitudinally extending seal which is applied to the foil especially by heat sealing the lateral/longitudinal margins of the foil web or by heat sealing in the vicinity of these margins thereby joining them. The foil tube has conventionally a rectangular cross-sectional area, thereby providing four edges (or corners) of the foil tube which extend parallel to the direction of flow of the foil. Conventionally, the foil tube can be closed by cross-sealing means in a direction perpendicular to the direction of flow, i.e. transversely. Thereby, individual bags are defined out of the continuous foil. A product, such as a foodstuff (to be packaged by the foil) is introduced by dropping the product through a fill pipe and into the foil tube surrounding the fill pipe, whereby the foil tube is transversely open, i.e. not cross-sealed. Thereafter, the foil tube (together with its content) is pulled downwardly, a (top) cross-seal is formed above the content (i.e. the product) and the closed bag produced thereby is then separated from the rest of the foil.

Such packaging machines are known and are used to manufacture tubular bags. It is further known in the art to provide the edges (or corners) as welded parts of the bag in order to provide an increased stiffness to these edges and therefore also to the bag. Such tubular bags show a relatively good stability - caused especially by the stiffened (welded) edges - and can therefore be used as standup bags. On side

surfaces or lateral surfaces of such bags, it is possible to print information in order to communicate better with the consumer. Moreover, packaging machines are known that provide the longitudinal seal (that joins the lateral margins of the foil web) near one of the edges of the bag. Thereby, the flexibility in printing information on the bag is greatly enhanced.

In known packaging machines, the longitudinal seal and the welded edges are applied at different stages of the production process of one bag. At a first (normally higher) position or height (i.e. on a plane perpendicular to the direction of flow of the foil) of the machine, the longitudinal seal is applied by joining the lateral margins of the foil web. At a second (normally lower) position or height (i.e. on a plane perpendicular to the direction of flow of the foil) of the machine, the welded edge portions are applied. Therefore, in known packaging machines, the foil web to be processed is in a first step longitudinally closed (by applying the longitudinal seal) and in a second step edge-welded or edge-sealed. Especially for vertical-type packaging machines, this means a great increase in overall-height of the machine. Other drawbacks of known packaging machines are their comparatively high cost associated with the increased required space as well as the greater complexity as there are different and separated sealing means required for the longitudinal seal on the one hand and for the welded edge portions on the other hand, which both work independently from one another.

The basic purpose of the invention is therefore to overcome these disadvantages and to provide a packaging machine being able to produce bags with stiffened edges, whereby the packaging machine is more cost-effectively built, which includes an increased space effectiveness and a lower mechanical complexity of the construction.

The purpose is attained by providing a packaging machine for producing tubular bags from a foil web, wherein the machine comprises a shaping shoulder, an edge forming means and one special sealing means, wherein the special sealing means is provided to apply to the foil both a longitudinal seal and an edge seal in a direction parallel to the direction of flow of the foil, wherein the special sealing means is provided such that the longitudinal seal and the edge seal are applied at least almost

simultaneously and in a common plane perpendicular to the direction of flow of the foil; i.e. the longitudinal seal and the edge seal are applied at the same height. By this provision, the machine can be built more space-effectively and especially for a packaging machine of the vertical type, the machine can be built such that it requires a reduced overall height compared to known packaging machines. In the context of the present invention, a "tubular form" of the bags means any cross-sectional form including a circular form or another form, and especially a rectangular form.

It is furthermore preferred that the special sealing means comprises a first part and a second part, wherein the first part is provided to apply the longitudinal seal and wherein the second part is provided to apply the edge seal. Thereby, the longitudinal seal and the edge seal can be spaced one from the other to a certain degree but the special sealing means still remains integrated. However, according to the invention, it is to be avoided, that the longitudinal seal and the edge seal are spaced too much apart (in a horizontal direction), because it is then more difficult to apply both the longitudinal seal and the edge seal almost simultaneously to the foil.

In a preferred embodiment of the invention, the first part and the second part (of the special sealing means) are provided at a common height (or vertical position) of the machine along the direction of flow of the foil. This results in a simple and effective way to apply the longitudinal seal and the edge seal almost simultaneously and in a common plane perpendicular to the direction of flow of the foil.

It is furthermore preferred that the first part and the second part (of the special sealing means) are actuated by a common actuator. A packaging machine showing this feature can be built with comparatively low complexity. This reduces the production costs for the machine and reduces the complexity with respect to the needs to control the machine. The special sealing means is an "integrated" sealing means because both its first part and its second part are actuated – at least indirectly – by a common actuator.

In a preferred embodiment of the invention, the first part and/or the second part (of the special sealing means) are connected to the common actuator by a coupling means. The coupling means assures that the actuation of the two parts by the

common actuator results in the application of the longitudinal seal and the edge seal to the tubular bag in an accurate and reliable manner and almost simultaneously. For example, it is possible that one of the parts is moving slightly behind the other in order to begin the welding operation of e.g. the longitudinal seal first and the welding operation of the edge seal later. However, the welding or sealing of both the first part and the second part (i.e. both the longitudinal seal and the edge seal) is always "simultaneous" according to the invention as there is always a common time interval in which both parts are applying a seal.

It is furthermore preferred that the longitudinal seal is applied to the margins of the foil or in the vicinity of the margins of the foil. The foil, which is first provided to the machine in the form of an (almost planar) web, is bent by the shaping shoulder of the machine to become a tube-like precursor of the bags to be produced. The lateral (or longitudinal) margins (along the direction of flow) of the foil are therefore approached to one another. By applying the longitudinal seal, the margins of the foil are sealed together by the one sealing means, thereby fixing the tubular form of the precursor of the bag. It is advantageous to apply the longitudinal seal either to the margins of the foil or at least in the vicinity of the margins of the foil because the foil is thereby used effectively. Advantageously, the margins of the foil are sealed and optionally folded such that only one side of the foil can be seen from the exterior of the bag.

In a preferred embodiment of the invention, the edge seal is applied in the vicinity of the longitudinal seal. Thereby, it is possible to use the side surfaces of the bag almost entirely for communication purposes with the consumer, i.e. it is possible to print almost completely on the side surfaces of the foil without, e.g. the presence of the longitudinal seal.

It is furthermore preferred that the shaping shoulder is provided asymmetrically. By this feature, it is possible to provide the longitudinal seal nearby the edge seal.

In a preferred embodiment of the invention, the machine comprises edge sealing means provided to apply to the foil further edge seals wherein the longitudinal seal, the edge seal and the further edge seals are applied almost simultaneously and in a common plane perpendicular to the direction of flow of the foil. The advantage of this

feature is that all the longitudinally extending seals of the bag, i.e. the seals applied by the special sealing means as well as the further edge seals, can be applied almost simultaneously and therefore in the same production cycle to the bag or the foil. The production of the bag can therefore be speeded up.

Another object of the invention is a method of producing tubular bags from a foil web transported through a packaging machine, especially a vertical-type packaging machine, wherein a longitudinal seal and an edge seal is applied to the foil in a direction parallel to the direction of flow of the foil, wherein the longitudinal seal and the edge seal are applied almost simultaneously and in a common plane perpendicular to the direction of flow of the foil. Thereby, the tubular bags are producible in an easier and more cost-effective manner.

The invention is disclosed referring to the figures of the attached drawings, by way of non limiting examples.

Figure 1 shows the packaging machine according to the invention schematically.

Figure 2 shows a bag produced by the packaging machine according to the invention.

Figure 3 shows in a detailed manner a transversal sectional view of **figure 1**.

Figure 4 shows in an even more detailed manner a part of the transversal sectional view of **figure 1** with a first embodiment of the sealing means.

Figure 5 shows a second embodiment of the sealing means.

Figure 6 shows another embodiment of the present invention

Figure 7 a special embodiment of the longitudinal seal.

In **Figure 1**, the packaging machine 1 according to the invention is schematically shown. The packaging machine 1 is preferably provided as a vertical-type packaging

machine 1 and comprises a shaping shoulder 3, a fill pipe 4 (also called a filling tube 4), edge forming means 31 and special sealing means 5. In the example depicted in **Figure 1**, the packaging machine 1 is also provided with edge sealing means 51.

A web of a foil 22, especially a weldable plastic foil 22, is supplied by rolls (not shown) of foil 22 material. The foil 22 web is then shaped by the shaping shoulder 3 to provide a rather tubular form to the material. In the context of the present invention, a "tubular form" of the bags or of the foil means any cross-sectional form including a circular form or another form, and especially a rectangular or generally a polygonal form. The edge forming means 31 provide a pre-shaping of edges of the tubularly formed foil 22 material. In a further step of the production process of the bag 2, the foil 22 material is sealed by the special sealing means 5 and the (optionally existing) edge sealing means 51. Thereby, the special sealing means 5 apply almost simultaneously a longitudinal seal and an edge seal to the bag 2/to the foil 22. The edge sealing means 51 apply (optionally) further edge seals. After sealing, the bottom of the bag 2 can be formed by a special bottom forming means 32. Finally, cross seals, extending perpendicularly (or transversally) to the direction of flow of the foil, are applied, especially by means of cross-seal jaws 6. These apply to the bag 2 not only a cross-seal closing the top of the bag 2, but these cross-seal jaws 6 advantageously also provide a cross-seal defining the bottom of the subsequent bag 2. The bags 2 produced are separated from one another by a cutting means (not shown).

The direction of flow 21 of the foil 22 is defined by the passage of the foil 22 at the shaping shoulder 3, at the edge forming means 31 and at the special sealing means 5/ edge sealing means 51. According to the invention, the special sealing means 5 applies both a longitudinal seal and an edge seal to the foil 22 at a common plane 52 perpendicular to the direction of flow 21 of the foil 22. In other words, the special sealing means 5 is provided at a common height 52 (i.e. a position or a plane perpendicular of the direction of flow 21 of the foil 22) of the packaging machine 1. According to the invention, the packaging machine 1 can be operated continuously or cyclically. The special sealing means 5 can apply the longitudinal seal 24 and the edge seal 25 continuously or cyclically.

Figure 2 shows a bag 2 produced by the machine 1. The bag 2 has four edges 27 and a longitudinal seal 24. The edges 27 are provided with edge seals, i.e. with welded portions parallel to the edges 27 of the bag 2, which increase the stiffness of the edges 27 and therefore the stability of the bag 2. One edge seal 25 is provided in the vicinity of the longitudinal seal 24. This special edge seal 25 is applied to the foil 22 (or the bag 2) together with the longitudinal seal 24 by the special sealing means 5. The further edge seals 26 at other edges 27 of the bag 2 are applied to the foil 22 by optionally existing edge sealing means 51 (shown in **Figure 3**). In a preferred embodiment of the packaging machine 1, the bag comprises four edges 27 and the packaging machine 1 comprises the special sealing means 5 as well as three further edge sealing means 51. The cross-section of the tubular form of the bags 2 in this embodiment is rectangular or trapezoid or rhomboid. In another preferred embodiment of the packaging machine 1, the bag 2 comprises three edges 27 and the packaging machine 1 comprises the special sealing means 5 as well as two further edge sealing means 51. The cross-section of the tubular form of the bags 2 in this other embodiment is triangular.

In **Figure 3**, a transversal section of the packaging machine of **Figure 1** along the height 52 (or the plane 52) is shown in a more detailed manner and in **Figure 4** in a still more detailed manner. The filling tube 4 is connected to four edge forming means 31 projecting away from the filling tube 4. These edge forming means 31 define the edges 27 of the bag 2 to produce. The edge forming means 31 are not present at the plane 52 because they precede (in the direction of flow of the foil 22) the special sealing means 5 the edge sealing means 51, as can best be seen from **Figure 1**. Therefore, the edge forming means 31 are represented in broken lines in **Figures 3 and 4**. The foil 22 surrounds the filling tube 4 (and the forming means 31). The special sealing means 5 applies the longitudinal seal 24 to the foil 22, thereby joining the lateral margins 23a, 23b of the foil 22. In the area of the longitudinal seal 24, the edges 23a, 23b of the foil 22 overlap such that a ridge 23 is recognizable on the surface of the bag 2. The special sealing means 5 apply almost simultaneously the edge seal 25 to the foil 22, thereby stiffening the edge area of one of the edges 27 of the bag 2. The margins 23a, 23b can also be sealed and optionally folded in a different way. For example, it is possible to apply an easy opening and/or a reclosable seal as the "longitudinal seal" 24.

To produce the other or further edge seals 26, the machine 1 is optionally equipped with edge sealing means 51. These work independently from the special sealing means 5 (i.e. especially with separate actuators) but at the same height 52 (or plane 52 perpendicular of the direction of flow 21 of the foil 22) of the machine 1 for a vertical-type packaging machine 1. Preferably, the edge sealing means 51 are provided (like the special sealing means 5) downstream from the edge forming means 31 along the direction of flow 21 of the foil 22.

In a preferred embodiment of the invention, the special sealing means 5 comprises a first part 5a and a second part 5b, e.g., provided as sealing jaws. The first part 5a produces the longitudinal seal 24 and the second part produces the edge seal 25.

The sealing means 5, 51 are provided preferably comprising sealing jaws with two jaws corresponding one another for each sealing means 5, 51. For example, **Figure 4** shows a first jaw 50a corresponding to and cooperating with the first part 5a of the special sealing means 5 and a second jaw 50b corresponding to and cooperating with the second part 5b of the special sealing means 5. To apply the longitudinal seal 24 or the edge seal 25, corresponding jaws (i.e. 5a and 50a / 5b and 50b) are approaching one another. This can either be achieved by a movement of both corresponding jaws or by a movement of only one of the corresponding jaws. The seals 24, 25 are applied by welding the foil 22 at least partially thereby, e.g., heating the jaw(s) (only one or both) at least locally or electro-welding the foil 22. The person skilled in the art understands that the first and the second jaws 50a 50b are metal parts, which are normally not heat and not movable.

In a first embodiment of the sealing means 5 shown in **figure 4**, the parts 5a, 5b of the special sealing means 5 are actuated by an actuator 5c common to the two parts 5a, 5b. The actuator 5c works especially electrically or mechanically and is preferably able to apply a force to both of the two parts 5a, 5b of the sealing means 5. The force applied by the actuator 5c moves the first and second part 5a, 5b towards the filling tube 4 and/or the jaws 50a, 50b, thereby sealing the foil 22. The person skilled in the art understands, that the overlapping of the film in the present example is different to the overlapping in example according to figure 6

Figure 5 shows a second embodiment of the special sealing means 5. In the second embodiment, the actuator 5c is able to apply a force only to one of the parts 5a, 5b directly (in the example given it applies the force directly to the second part 5b). The other part is actuated by means of a coupling means 5d between the other part and the actuator 5c. The coupling means 5d is preferably provided as an elastic means 5d, e.g., a spring means 5d, i.e. a mechanical spring joining the indirectly actuated part (the first part 5a in the example given) of the sealing means 5. In the first and in the second embodiment of the special sealing means 5, the first and second part 5a, 5b are actuated commonly, i.e. not separately. According to the invention, it is, of course, possible that both parts 5a, 5b are actuated by the common actuator 5c by means of a coupling means 5d.

Figure 6 shows essentially the embodiment according to figure 4. However in the present case the jaw 50a is only a rubber part attached to filling tube 4. The jaw 50b is a metal part with also a rubber part at its top, which is not movable and normally not heated.

In **Figure 7**, a special embodiment of the longitudinal seal is shown. As can be seen, the edge 23 b of the film has been folded, so that the same sides (the inside) of the film overlap each other and can be sealed together.

Reference signs

1	packaging machine
2	bag
3	shaping shoulder
4	filling tube
5	special sealing means
5a	first part of the special sealing means
5b	second part of the special sealing means
5c	actuator
5d	coupling means
6	cross-seal jaws
21	direction of flow
22	foil
23	ridge
23a, 23b	margins
24	longitudinal seal
25	(special) edge seal
26	further edge seals
27	edges
31	forming means
32	bottom forming means
50a, 50b	jaws, rubber part, metal part
51	edge sealing means
52	plane, height